DOCUMENT RESUME

ED 213 516 PS 012 706

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TITLE Thinking: A Forgotten Basic Skill.
PUB DATE Nov 81
NOTE 18p.; Paper presented at the Conference of the New Jersey School Boards Association (Atlantic City, NJ, November 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Basic Skills; *Cognitive Processes; *Curriculum; *Educational Needs; *Educational Practices; Elementary Education; *Instructional Development
IDENTIFIERS *Rationality

ABSTRACT

The nature of thinking as perhaps the most basic of all intellectual skills and the neglect of thinking as a valuable skill to teach in formal educational settings are discussed in the first two sections of this paper. The third section provides a rationale for teaching effective thinking skills in school. (Author/RH)

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THINKING: A FORGOTTEN BASIC SKILL*

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*Presented at the New Jersey School Boards Association Conference

Atlantic City, New Jersey

November 1981

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Before embarking on an examination of thinking as a forgotten basic skill, we need to define our terms and clarify our conception of what thinking is and what it is not.

Thinking is a process of mentally operating on information. There are two major types of mental operations which characterize thinking. One is the process of examining existing information; the other is the process of constructing additional information. Constructive operations are initiated when an individual is confronted with information that has gaps which need to be completed. Therefore thinking, in part, is a gap-filling process--a mechanism for generating information which will fill in gaps in knowledge. This type of thinking requires going beyond the information that is already given and developing new ideas, connections or evidence. Making inferences and generating hypotheses are examples of constructive operations. Problem-solving and creativity both require the construction of additional information.

Examination, the other major category of thinking, is a process of operating on information which is already available. Reflective thinking, which includes reviewing and reformulating information, constitutes one form of examination. Critical thinking is another form of examination. Critical thinking includes skills such as analyzing, comparing and evaluating information.

In many situations which require thinking, both examination and construction are involved. For instance, making a decision whether to purchase a reading textbook series from publisher X or publisher Y requires examining the existing information about both sets of materials and constructing a view of these two alternatives which characterizes one of them as more

appropriate or desirable than the other. This new view represents new information about the material and serves as the basis for making a decision about which to purchase.

Thinking is not identical with intelligence or learning. Intelligence denotes the capacity for thinking rather than the thinking process itself. Learning refers to the process of acquiring or improving knowledge or skill; whereas learning focuses on knowing, thinking is primarily a matter or doing (Russell 1956).

Why is Thinking Basic?

Thinking is perhaps the most basic of all intellectual skills. It provides a foundation for the acquisition and development of other basic skills, it underlies learning in all content areas, and it is a principal constituent of many everyday life experiences.

Underlies Other Basic Skills

Curtis Miles (1981), Director of the Center for Reasoning Studies at Piedmont Technical College, argues that thinking and basic skills are indivisible.

> "... writing skills emerge as the student masters the thinking skills needed to see the relationships among words, sentences, evidence and arguments in logical ways. In reading, "making sense" of a passage implies generic thinking skills: cause and effect, inference, analysis, abstraction, etc. "Understanding" the interdependence of noun and verb or the logic behind what happens when two negative numbers are multiplied may have more to do with thinking skills than with grammar or math content." (Miles, 1981)

An examination of the processes involved in reading, writing and mathematics demonstrates that each of these basic skills is dependent upon the ability to think.

The importance of thinking to the development of math skills has long been recognized. Cooley etal. (1937) in their Introduction to Mathematics

stated, "Mathematics is as much a method of reasoning as it is a body of conclusions." (Burton etal. 1960). One type of math problem which is famous for causing school performance anxiety dreams is the "story" or "word" problem. The following is typical of the kind of word problem an elementary school child might encounter:

> The junior scouts went to camp. Each troop had to take turns helping in the kitchen. One morning, Troop 1 served cereal in individual boxes. On the shelf were four packs of cereal with ten boxes in each sealed pack; also, there were two individual boxes. There were 29 children to be served. How many boxes of cereal were left on the shelf after breakfast? (Swenson 1971)

Mathematically, this is a simple problem which only requires calculating skills of addition and subtraction. However, intellectually, mathematical calculations are only part of what is involved. Solution also entails problem definition; identification, collection, organization of relevant information; and verification of the hypothesized solution. This simple problem, therefore, requires a combination of calculation, reading comprehension and problem solving skills. Math encompasses a wide variety of problems. Calculating a percentage, solving an equation for an unknown, and constructing a proof of a theorem all require thinking.

Although it is not commonly recognized, reading and writing are also dependent upon thinking. Like mathematics, reading, in many ways, is a form of problem solving. Reading requires the translation of individual letters into coherent and meaningful units called words. It involves interpreting the meaning of chains of words which form sentences, and it includes determining the meaning of individual sentences within the total context. Thus, reading is not simply a matter of decoding the printed word. Altick (1951) points out that good reading involves going beyond interpreting the written message to determine what lies beneath the surface, "... the hidden implications and motives of the writer."

In addition to reading, a person must be able to write in order to be considered functionally literate. Writing is not a process of randomly putting marks on a piece of paper. And, writing is more than a mechanical process of coordinating the eye and hand to copy what someone else has conceived and written. True writing involves producing and organizing ideas in order to communicate with others or express oneself. Laurita (1973) argues that writing is an extension or reflection of an individual's total cognitive activity. It is not just a combination of penmanship, punctuation, syntax and spelling. It is part, "... of the total symbolic system developed sequentially as a result of the organism's ability to translate concrete reality received through the senses into symbols." Narveson (1976) makes a similar point. He believes that the ability to read and write, "... is not simply a function of teaching, but is also dependent upon the individual's level of intellectual development." Thus, teaching maybe necessary, but it is not sufficient for writing. Writing requires thinking, and the quality of a person's writing is at least partially dependent upon the person's ability to think.

While mathematics, reading and writing are usually singled out as comprising "the basic skills," there are additional cognitive competencies which are basic to our lives. Speaking, listening and remembering are other basic skills, and they are also dependent upon an individual's level of thinking.

Underlies Content Learning

In general, educators are concerned with two major sets of academic goals. One entails the development of basic skills; the other involves the acquisition of a body of knowledge in particular content areas. The academic curriculum has three principal subdivisions: science, English (language arts), and social studies. Thinking is necessary to integrate information received

in these courses so that it does not remain fragmented in one's mind.* Without thinking, how would one organize and remember information received from different sources and on different days of the week? In order to master the content taught in the various curricular areas, the student must be able to think effectively.

With the exception of mathematics, science is perhaps the only subject matter which is widely recognized as requiring effective thinking. Awareness of the role of thinking in science is probably a function of the "scientific method's" status as an integral part of the curriculum of virtually all science courses. The scientific method is a general model of problem solving.

Language Arts courses focus on learning to use the English language and appreciation of literature. Mastery of grammar, with all of its rules and exceptions, involves thinking. Understanding poetry entails skills such as making analogies, perceiving ironies, recognizing and interpreting symbols, and constructing an image of the portrait the poet is painting.

Literary criticism is one of the main features of English courses after elementary school. Burton etal. characterize it as involving the analysis of expository prose and critical thinking. Specific skills they cite as being used in literary criticism include: recognizing and defining problems; drawing inferences; recognizing and appraising assumptions, errors and fallacies; and making sound decisions.

Many of these same thinking skills are required for mastery of social studies, which traditionally includes: history, geography, civics, economics and sociology. Specific objectives of social studies courses include: becoming aware of problems of values, examining alternative social systems and understanding the causes and consequences of historical events. These objectives are based on the assumption that students have developed a number of thinking competencies without the benefit of direct instruction.

To what extent can educational goals and objectives be met while thinking retains the status of a forgotten basic skill?

*I am grateful to Serge Madhere for this point

Basic For Everyday Life Experience

How frequently and in how many different types of situations do people ask themselves: Why did that happen? What would happen if...? Which is the best way to...? Reflection, explanation, anticipation of consequences, planning, comprehension, problem solving, evaluation and decision making are central to all aspects of our lives. From sipping that first cup of coffee, until finally managing to shut out the day's activities and concerns and dropping off to sleep, we spend a considerable portion of our time thinking.

In order to appreciate how basic thinking is to our everyday life experience, let's trace a day in the life of a hypothetical person and consider the amount and types of thinking normally engaged in. Our hypothetical person is a 35 year-old woman who lives with her 10 year-old son, and works as a secretary for the board of education.

Alarm goes off. She immediately wonders, is Michael awake, cleaned up and getting his breakfast? She checks on Michael to verify he's on schedule. While drinking her coffee, she reflects on the dream she was having when the alarm sounded.

She begins to pack a lunch for Michael by mentally reviewing what he had yesterday, what is in the house, and what they'll be having for dinner. She has just enough time to read the front section of the newspaper. In it, she notices how the perspective on national news differs from that of the network TV news report.

She must not forget to feed the cat. Getting into the car, she remembers she's low on gas. How much further can she go on what's left? She anticipates the usual traffic jam up ahead. Once she gets there, she examines the situation to determine which lane is moving faster today.

On the elevator going up to the office, she recognizes a man, but cannot remember which department he's in. When he gets off at the third floor, she

infers that he's in Data Processing.

At her desk, she reviews her schedule and begins to plan the day's activities. She explores alternative ways of coordinating her tasks, so she can make efficient use of her time. A batch of supplies came in yesterday. Where did she put them? When will she distribute them? Who gets what?

A stack of memos to be typed are on her desk. Which has top priority? How long will it take to prepare? When is it needed? The phone rings, and she must explain to her boss why a report was not sent out on time.

During the ride home, she reflects on the day's events and anticipates tomorrow's agenda. She smiles as she thinks how at dinner, Michael in going to tease her about inventing yet another way to prepare hamburger.

After dinner, she helps Michael with his homework. Tonight, they have to work on math and social studies. Michael goes to bed, and she has a couple of hours to read a novel. Doris Lessing's work is not what one would call easy reading. It's getting late. She starts to yawn. She gets up to take a couple of aspirins to get rid of a headache acquired from the day's overload of mental activity, so she can go to sleep and start all over again tomorrow.

Why Has Thinking Been Forgotten?

Not Valued

Many students today lack confidence in their academic skills and accept that they need instruction, even remedial instruction, in reading, writing and math. These are traditionally considered to be requisite skills for succeeding in life in a literate society. Our culture values these skills and provides them a legitimacy, indeed, deems them to be a necessity in our educational experience. Reading, writing and math are skills which must be taught. Instruction in these basic skills, whether formal or informal, constitutes

part of the educational experience of all literate people. Specific instruction in them is not only accepted, but expected. Teachers and students do not have to be convinced of the benefit of instruction in these areas. Most teachers and students recognize that pupils cannot improve their basic skills entirely on their own. Not only do teachers and students agree that improvement in reading, writing and math is possible, they also consider it to be desirable. Such is not the case with thinking. It does not form a distinct part of the traditional academic curriculum. Perhaps at least part of the reason that thinking has been forgotten is that it has never been formally sanctioned by our educational system. Lack of official status of thinking as a legitimate educational outcome may impel students and teachers to consider instruction in thinking to be neither possible nor desirable (Hartman-Haas 1981). Thus, we have the proverbial vicious cycle--it's not sanctioned--so it's not taught --so it's not valued--so it never will be sanctioned!

Educational content reflects the nature of a society. Another reason why thinking may be forgotten mirrors the values and character of our society. Our culture typically emphasizes and respects tangible, concrete reality. Compared to other nationalities, Americans have a reputation for being materialistic and seeking immediate gratification. The abstract nature of thinking may conflict with the American psyche's predilection for the concrete. In addition, while the evidence of and rewards for reading, writing and math improvement can be readily discernable, the evidence and benefits of improved thinking are more intangible and take longer to accrue. Therefore, because of our society's values, thinking is a likely skill to be forgotten.

Finally, since few individuals in our society have ever received direct instruction in thinking, it is possible that many educators fee unsure about the level of development of their own thinking skills. If thinking is

excluded from the curriculum, they may not have to confront the possibility of their own intellectual weaknesses. Thus, introducing thinking into the curriculum may breed educator insecurity and put teachers on the defensive. Feuerstein (1980) reports that teachers undergoing training to implement his improving thinking program complained upon having difficulty with an exercise. One teacher commented, "If I'm having trouble with it, how are my students ever going to be able to do it?"

Valued - But Taken For Granted

Some educators argue that thinking has not been forgotten. The fact that thinking has not been given the status of a separate skill to be taught and developed does not mean that thinking has been forgotten. People ascribing to this position believe that effective thinking is a valued educational outcome which is assumed to develop through the traditional curriculum. Writing in the New York Times, Maeroff (1981) suggests "educators take it for granted that students will learn to think merely by going to school." Frequently, an error is made by treating thinking as only a subsidiary of other processes rather than as a major topic in its own right. (Johnson 1972) It is taken for granted that studying disciplines such as science and mathematics will result in adequately developed thinking skills. There may be some validity to this position. As I argued earlier, thinking is basic to all other skills and content area courses. Science and math can require the pupil to utilize higher order thinking skills. The key word in this statement is "can." It is a well-founded academic truism that many times courses such as mathematics are taught in such a way as to emphasize memory rather than meaning, and therefore draw upon rote intellectual activity instead of reasoning and comprehension.

However, even when traditional content area courses are taught with the emphasis on meaningful learning and reasoning, is this indirect route to

developing thinking skills adequate? Can we assume that as a by-product of good instruction in science and math, students will develop their cognitive abilities to the highest level desirable and attainable? Another aspect of this issue merits consideration: we cannot control how the teacher presents material in the classroom. Therefore, we cannot guarantee that instruction in any particular content area will emphasize comprehension and reasoning rather than rote learning. However, we can have some influence over what subject matter is taught. We can introduce into the curriculum thinking as a distinct area of instruction, so that we do not have to take it on faith that the development of thinking skills will receive at least some direct attention.

Valued But Deferred

A number of educators recognize there is merit in instruction designed to improve students' thinking, but believe that such instruction should be postponed until students have mastered the basic skills. This position is based on the belief that basic skills should take priority over thinking skills. (Miles 1981). With the slow rate of basic skill development observed in recent years, ascribing to this position is tantamount to postponing instruction in thinking indefinitely.

Systematically Discouraged

There is a Machiavellian explanantion of why thinking has not been included in the curriculum. Rather than being forgotten, one must consider the possibility that thinking intentionally has been excluded from the educational process. Students who think actively, effectively and independently may not be as easy to control as students who respond passively and mechanically, out of habit , and in conformity with existing standards and mores.

Even more importantly, however, children-student thinkers become adult-citizen thinkers who conceivably could represent a threat to our highly technocratic way of life. Our society requires the manufacturing of individuals who will fit as cogs in the machinery which builds and operates our economy and institutions. Automaton thinkers may be kept on an assembly line more easily than people who think critically, creatively and on a more mature level of cognitive development.

Friere (1970) contrasts education for effective thinking with the "banking concept" of education. The banking concept refers to an orientation towards education which is characterized by teaching a passive student to memorize information.

"Education thus becomes an act of depositing in which the students are the depositories and the teacher is the depositor. Instead of communicating, the teacher issues communiques and makes deposits which the students patiently receive, memorize and repeat. This is the "banking" concept of education in which the scope of action allowed to the students extends only as far as receiving, filling and storing the deposits. They do, it is true, have the opportunity to become collectors or cataloguers of the things they store. But in the last analysis, it is men (and women) themselves who are filed away through the lack of creativity, transformation, and knowledge in the (at best) misguided system. For apart from inquiry....men cannot be truly human. Knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry men pursue in the world, with the world and with each other."

"In the banking concept of education knowledge is a gift bestowed by those who consider themselves knowledgeable upon those whom they consider to know nothing. Projecting an absolute ignorance onto others, a characteristic of

the ideology of oppression, negates education and knowledge as a process of inquiry." (Friere 1970)

Friere (1970) suggests that Machiavellian motives, in fact, do underlie the failure to develop students' powers of thought. He remarks:

> It is not surprising that the banking concept of education regards men as adaptable, manageable beings. The more students work at storing the deposits entrusted to them, the less they develop...critical consciousness...The more completely they accept the passive role imposed on them, the more they tend simply to adapt to the world as it is and to the fragmented view of reality deposited in them.
>
> The capability of banking education to minimize or annul the students' creative power and to stimulate their credulity serves the interests of the oppressors, who care neither to have the world revealed nor to see it transformed. The oppressors use their "humanitarianism" to preserve a profitable situation. Thus, they react almost instinctively against any experiment in education which stimulates the critical faculties and is not content with a partial view of reality but always seeks out ties which link one point to another and one problem to another.

Valued But...Not Know How To Teach It

Thinking may be excluded from the traditional curriculum for yet another reason. Lauren Resnick (1981) said, "Right now we teach kids certain skills or tasks, and we do it within particular subject matter areas such as reading, mathematics, and science. What we don't teach, because we don't know how, is "inference," one of the greatest of all our intellectual tools. We allow room for inference. That is, we assume that as children advance through their educational experience, they will begin to infer a body of knowledge from various learning experiences." (Schneider 1981).

Therefore, part of the reason thinking is not taught may be because theory and research concerning improving thinking have yet to be developed to the state where educators have extensive knowledge and resources for effectively educating students to think better.

Miles (1981) reports that when he encounters the argument that we should not teach thinking now because research has not yet shown us "how best to stimulate cognitive development in the classroom," he replies that just because we do not know the best ways does not mean we do not know any solid ways to enhance thinking skills.

Why Does Effective Thinking Need To Be Taught?

For educators who assume that competence in thinking will develop without direct instruction, contradictory evidence has been mounting. Recently newspapers have been filled with reports indicating that while students are improving their basic skills, they are startlingly deficient in the higher order, more complex cognitive skills. Opponents of prioritizing basic skill have warned that teaching for minimum competency in basic skills endangers the achievement of other academic aims, as the minimum required becomes the maximum attained.

Before 1972, Piaget believed that formal thought begins around the age of ten (Piaget 1928) and reaches its "equilibrium point" by the age of fourteen or fifteen (Inhelder and Piaget 1958). However, in an important modification of his theory, Piaget (1972) acknowledged that the development of formal operational thinking, the highest level in his stage theory, is not inevitable. Research has demonstrated that as many as 50% of college freshmen are not capable of, much less competent with formal operational thought processes (Tomlinson Keasey 1972, Wason 1968, Lovell 1961, Karplus 1974). (ADAPT 1976).

Feuerstein (1980), developer of Instrumental Enrichment, an improving thinking intervention program, argues that without special intervention, some people may never develop the more complex intellectual abilities. His theory of the need for formal instruction in thinking is based on his concept of "mediated learning experiences." He argues that for many children, especially those with enriched home environments, mediated learning experiences are

provided by"....adults in the child's life who can effectively focus attention and interpret to (the child) the significance of objects, events and ideas in (his or her) social surround....." (Feuerstein 1980). He believes that children from homes which lack such mediated learning experiences are especially in need of intervention to promote the development of cognitive structures required for learning.

Another reason why thinking should be taught is implicit in a new theory of learning and instruction developed by Lauren Resnick and her colleagues at the Learning Research and Development Center in Pittsburgh. The essence of the new theory is that learning occurs through utilization of a "highly interconnected body of knowledge." Therefore, educators should be teaching students to use the knowledge they have acquired. Making inferences from this integrated body of knowledge is at the heart of their theory of instruction.

This "glass box" theory is based on research which shows that children make inferences which enable them to transfer understanding of one problem to the solution of another problem. Instead of just "allowing room" for students to make inferences, we have to teach students how to use their "inferential capacities and tendencies." The theory is described by Resnick as " contrasting with the behaviorists' notions in that it adapts instruction not just to mastery or nonmastery of tasks, but to an inferred knowledge structure in the learner."

In addition to all of the scientific reasons for improving thinking, there are practical and humanitarian reasons for teaching this basic skill. Because of the rapidity with which change is occurring, the knowledge of today will be obsolete by tomorrow. Therefore, it is more important to focus on developing thinkers than to concentrate on "making deposits."*

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*I am grateful to Jann Azumi for this point.

Burton, etal. (1960) argued that not only is the improvement of thinking worthwhile, but there may be dire consequences of not improving thinking. "....Incomparable improvements in the worth and security of life have resulted from competent thinking. This is true for the individual, the community group, and the nation. There is hope that sound thinking may be applied to international affairs. Incorrect and/or dishonest thinking has precipitated disaster many times in our economic, social, political and military history. Considerable disaster could still result if we do not take thought. Every area of human endeavor from rearing children to the management of international relations is affected."

Burton, Kimball and Wing made this argument in 1960. Today, it is even more valid than it was over 20 years ago. We live in a precarious age. The profound and intractable problem of world hunger is becoming increasingly serious. Civilization as we know it rests at the proverbial button away from destruction as nuclear weapons proliferate. Superpowers vie for influence in the world. Terrorists of the right and left seek attention for their causes. Our fate is held in dangerous hands.

It is more important than ever that we raise generations of children who can think clearly and effectively about these problems. Our leaders and decision makers of the future must be able to generate, examine and evaluate alternative solutions to these and unforeseen problems. They must have the ability to conceptualize the implications of whatever course of action they pursue. It is vital that we introduce "improving thinking" into the educational curriculum. The survival of our children, our nation, our species and even our planet may depend on it.

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